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Disposable Electrode Chamber for Measuring Opercular Movement of Fathead Minnows

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16 ABSTRACT

A simple, disposable electrode chamber to measure the opercular movements the opercular movements of fathead minnows is described.

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TITLE OF JOURNAL ARTICLE	COPIES
Disposable Electrode Chamber for Measuring Opercular Movements of Fathead Minnows EPA-J-77-035	1

cc: Evelyn Hunt

EPA-600/3-77-025
JOURNAL ARTICLE

Disposable Electrode Chamber for Measuring Opercular Movements of Fathead Minnows

The electrode chamber method described by Spoor et al. (1971) is a reliable technique for measuring opercular and locomotor movements of most free-swimming fishes. However, recordings of opercular movements of fathead minnows (*Pimephales promelas*) are difficult to obtain in these rectangular electrode chambers because the opercular movements are masked by the almost constant swimming motions. Cylindrical chambers with the electrodes at each end are better for detecting the opercular movements because the fish are more closely confined. Since cylinders made of glass or acrylic materials are laborious to construct and clean, I developed a simple, disposable chamber to measure the opercular movements of fathead minnows.

Each chamber is designed to hold one fish 5 cm long. The chamber is a section of Tygon[1] tubing 30 cm long (1.3 cm ID, walls 1.5 mm thick) bent at a 60° to 90° angle at one-third the length of the tube, and fastened to a Styrofoam base 2.5 cm thick (Fig. 1). Wood braces keep the vertical portion of the tube upright. Two stainless steel wires 1.5 mm in diameter are sharpened on one end and driven through the tube into the styrofoam base. Optimum recordings are obtained when the distance between the electrodes is less than 1.5 times the length of the fish. Incoming water enters the top of the tube, passes the fish, and drains through a longitudinal channel in the neoprene stopper at the outlet (Fig. 1). A small constricting clamp placed just ahead of the inlet electrode confines the fish between the two electrodes.

In use, the horizontal section of the electrode chamber is stoppered and filled with water. The base is tipped to prevent the water from draining from the outlet when the stopper is removed to place a fish in the tube facing the inlet. Small fish slide past the rear electrode; for large fish the electrode at the drain end must be removed. The drain stopper is replaced, the base is lowered into the horizontal position, and the electrodes are coupled to a high-gain polygraph (Spoor et al. 1971).

The length and diameter of the Tygon chamber can be varied, depending on the size of fish used. Chambers can also be made of Teflon[1] tubing, but they often leak around the electrodes because of the thinness of the tubing wall. The fish should not be cramped in the chamber, yet they should be unable to turn around.

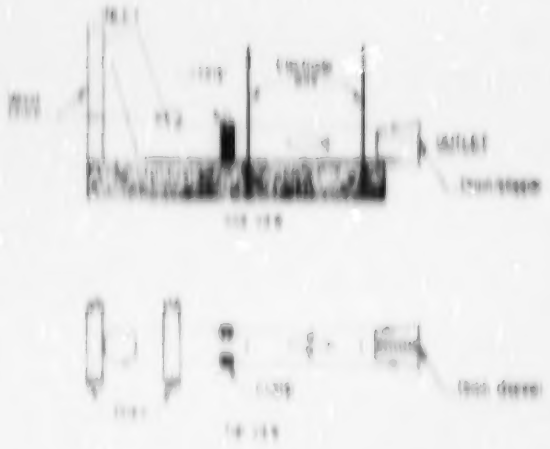

Fig. 1. Schematic diagram of the electrode chamber.

Water velocity of 15 cm/min or less allows the fish to maintain its position without swimming forward periodically.

Because the fish are more confined than in a rectangular chamber, the cylindrical chamber seems best suited for short-term studies. However, fathead minnows have been held in the chambers for 3 weeks without apparent harm. Food can be added at the water inlet.

In toxicity tests, loss of organic materials through absorption should be minimal because of the small surface area of the tube. The advantages of this method are that the chambers can be constructed quickly and inexpensively, work well, and are disposable.

References

Spoor, W. A., F. J. Nesheim, and R. A. Drummond. 1971. An electrode chamber for recording respirators and other movements of free-swimming animals. Trans. Am. Fish. Soc. 100:23-28.

Robert A. Drummond, *U.S. Environmental Protection Agency, Environmental Research Laboratory-Duluth, Duluth, Minn. 55804*

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[1] Mention of trade names does not constitute endorsement by the U.S. Environmental Protection Agency.